

Appl'n No. 09/545,589
Responsive Amendment dated May 24, 2005
Reply to Office Action of February 24, 2005

Amendments to the Claims:

Please amend the following: Claims 16, 34, and 47. Claims 1-15 and 53-58 were previously cancelled without prejudice in connection with a restriction requirement. This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Cancelled)
2. (Cancelled)
3. (Cancelled)
4. (Cancelled)
5. (Cancelled)
6. (Cancelled)
7. (Cancelled)
8. (Cancelled)
9. (Cancelled)
10. (Cancelled)
11. (Cancelled)
12. (Cancelled)
13. (Cancelled)
14. (Cancelled)
15. (Cancelled)
16. (Currently Amended) A method of applying a digital watermark to a content signal with a plurality of functions, including the input of at least a random key and a digital watermark, the method comprising the steps of:
 - (1) providing a random key generated by the following steps:

(a) generating a random sequence of binary numbers; [and]

(b) generating information describing the application of the random sequence to the content signal, wherein the information comprises a sample window size, a signal encoding level, and at least one of the following two groups: time delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal; and

(c) combining the random sequence and the generated information to form a random key;

(2) providing a digital watermark to be embedded; and

(3) embedding the digital watermark using at least the random key and the plurality of functions to produce a uniquely watermarked content signal.

17. (Previously Presented) The method of claim 16, wherein the step of generating information comprises:

using human interactive input to generate information describing the application of the random sequence to the content signal, wherein the information comprises a sample window size, a signal encoding level, and at least one of the following two groups: time delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal.

18. (Previously Presented) The method of claim 16, wherein the step of generating information comprises:

creating at least one graphical representation of the content stream in at least one of the time domain and the frequency domain; and

using the at least one graphical representation to generate information describing the application of the random sequence to the content signal, wherein the information comprises a sample window size, a signal encoding level, and at least one of the following two groups: time

delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal.

19. (Previously Presented) The method of claim 18, wherein the step of creating at least one graphical representation comprises creating graphical representations of the content stream in both the time domain and the frequency domain.

20. (Previously Presented) The method of claim 18, wherein the step using the at least one graphical representation to generate information comprises:

using the at least one graphical representation to provide human interactive input to generate information describing the application of the random sequence to the content signal, wherein the information comprises a sample window size, a signal encoding level, and at least one of the following two groups: time delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal; and, wherein the method of claim 18 further comprises:

updating the graphical representations to reflect the human interactive input.

21. (Previously Presented) The method of claim 16, wherein the step of generating information comprises:

providing at least two sample streams of the content signal for selection;

selecting one of said at least two sample streams of the content signal;

generating information describing the application of the random sequence to the selected sample stream of the content signal, wherein the information comprises a sample window size, a signal encoding level, and at least one of the following two groups: time delimiters describing

segments of the content signal; frequency delimiters describing frequency bands of the content signal.

22. (Previously Presented) The method of claim 16, wherein the step of generating a random sequence comprises:

generating a pseudo random sequence of binary numbers.

23. (Previously Presented) The method of claim 16, wherein the step of generating the random sequence comprises:

- (a) collecting an initial series of random or pseudo random bits;
- (b) processing the initial series of random or pseudo random bits through a secure one-way hash function;
- (c) using the results of the one-way hash function to seed a block encryption cipher loop;
- (d) cycling through the block encryption cipher loop and extracting the least significant bit of each result; and
- (e) concatenating the extracted least significant bits to form a random key sequence.

24. (Previously Presented) The method of claim 23, wherein the step of collecting an initial series of random or pseudo random bits comprises:

collecting an initial series of bits through human interactive input.

25. (Previously Presented) The method of claim 16, wherein the step of generating information comprises:

processing the content signal to determine a signal encoding level, to identify time delimiters describing segments of the content signal and to identify frequency delimiters describing frequency bands of the content signal;

generating information describing the application of the random sequence to the content signal using the predetermined signal encoding level, the pre-identified time delimiters and the pre-identified frequency delimiters.

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26. (Previously Presented) The method of claim 25, wherein the step of processing the content signal is accomplished using mathematical calculations based on signal properties of the content signal, said mathematical calculations being selected from the group consisting of: an autocorrelation functions; root mean squared energy calculations; mean squared difference in samples calculations; measurable distortion calculations; spectral energy characteristics; and a combination thereof.
27. (Previously Presented) The method of claim 16, wherein the step of generating information comprises:

generating information describing the application of the random sequence to the content signal, wherein the information comprises a sample window size, a signal encoding level, channel utilization information, and at least one of the following two groups: time delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal.

28. (Previously Presented) The method of claim 16, wherein the step of generating a random sequence of binary numbers comprises generating a plurality of sequences of binary numbers, and wherein the step of generating information comprises:

processing the content signal to divide the content signal into a plurality of channels;

processing each of the plurality of channels to determine a signal encoding level, to identify time delimiters describing segments of the content signal, to identify frequency delimiters describing frequency bands of the content signal; and

generating information describing the application of one of the plurality of sequences to each of the plurality of channels using the predetermined signal encoding level, the pre-identified time delimiters and

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- the pre-identified frequency delimiters for each one of said plurality of channels.
- 29. (Previously Presented) The method of claim 16, further comprising:
 - storing the random key in a database.
- 30. (Previously Presented) The method of claim 16, further comprising:
 - concatenating the random sequence of binary numbers together with the generated information into a string; and
 - encrypting the concatenated string; and
 - storing the encrypted, concatenated string in a database.
- 31. (Previously Presented) The method of claim 16, further comprising:
 - using the generated information to embed a plurality of watermarks into the content signal.
- 32. (Previously Presented) The method of claim 31, further comprising:
 - generating a watermark information signal comprising watermark synchronization information to help locate a watermark in the content signal and information to help assess the validity of said watermark;
 - placing the watermark information signal within the content signal so as to not interfere with any digital watermarks embedded in the content signal.
- 33. (Previously Presented) The method of claim 16, further comprising:
 - creating a watermark comprising: a title identification; a unit measure; a unit price; a percentage transfer threshold at which liability is incurred to a purchaser; a percent of content transferred; an authorized purchaser identification; a seller account identification; a payment means identification; a sender's digitally signed information indicating percent of

content transferred; and a receiver's digitally signed information indicating percent of content received; and

using the generated information to embed the watermark into the content signal.

34. (Currently Amended) A method of embedding a digital watermark into a content signal with a plurality of functions, including the input of at least a random key and a digital watermark, the method comprising the steps of:

(1) providing a random key generated by the following steps:

(a) generating a random or pseudo-random sequence of binary numbers;

(b) associating with the random or pseudo random sequence, one or more references to encoding functions for encoding at least one watermark into a content signal; and

(c) combining the random or pseudo random sequence and the associated references to encoding functions to form a random key; [and]

(2) providing at least one watermark to be embedded into a content signal; and

(3) embedding the digital watermark using at least the random key and the plurality of functions to produce a unique content signal.

35. (Previously Presented) The method of claim 34, wherein said one or more references is selected from the group consisting of: integer indices that reference chunks of computer code; alphanumeric strings which name software modules or code resources; and memory addresses of memory locations wherein software programs reside in a computer memory.

36. (Previously Presented) The method of claim 35, wherein said one or more references comprise alphanumeric strings which identify software modules that can be used to embed a watermark into a content signal.

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37. (Previously Presented) The method of claim 34, wherein said one or more references is selected from the group consisting of: a encode/decode algorithm which is capable of encoding and decoding bits of information directly to and from the content signal, a function which relates the sequence of binary numbers to the content signal; a function which assesses the frequency content of the content signal before embedding the at least one watermark; a function which is capable of encrypting and decrypting information contained in the at least one watermark, and a function which embeds into the content signal an informational signal which comprises information about the at least one watermark such that the informational signal may be used to correct any errors that may have been introduced into the at least one watermark.

38. (Previously Presented) The method of claim 34, further comprising:
generating a second random or pseudo-random sequence of binary numbers;
associating with the second sequence, one or more references to decoding functions for decoding at least one watermark into a content signal; and

extracting at least one watermark from a content signal using the referenced decoding functions.

39. (Previously Presented) The method of claim 36, wherein said one or more decoding references comprise alphanumeric strings which identify software modules that can be used to extract a watermark from a content signal.

40. (Previously Presented) The method of claim 34, further comprising:
storing the random key in a database.

41. (Previously Presented) The method of claim 34, further comprising:
concatenating the random sequence of binary numbers together with the generated information into a string; and.

encrypting the concatenated string; and
storing the encrypted, concatenated string in a database.

42. (Previously Presented) The method of claim 34, wherein the content signal is selected from the group consisting of: an audio signal; a video signal; and a still image, and the step of associating comprises:

associating with the random or pseudo random sequence, one or more references to encoding functions specifically designed for encoding at least one watermark into an audio signal, a video signal or a still image.

43. (Previously Presented) The method of claim 34, wherein the embedding step comprises:

embedding at least one watermark into a content signal using the referenced encoding functions, said at least one watermark comprises distribution restriction information.

44. (Previously Presented) The method of claim 43, wherein the distribution restriction information comprises one or more of the following: a geographical constraint on distribution; a logical constraint on distribution; a Universal Resource Locator (URL); a telephone number; an Internet Protocol address; an Internet domain name; an e-mail address; and a file name.

45. (Previously Presented) The method of claim 34, further comprising:

interleaving information about each of said at least one watermarks into the content signal.

46. (Previously Presented) The method of claim 45 wherein the interleaving is accomplished by placing information about each of said plurality of digital watermarks into specific frequency bands of the content signal.

47. (Currently Amended) A method of embedding a plurality of digital watermarks into a content signal with a plurality of functions, including the input

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of at least a random key and a digital watermark, the method comprising the steps of:

- (1) providing a random key generated by the following steps:
 - (a) generating a random or pseudo-random sequence of binary numbers for each of the plurality of digital watermarks to be embedded;
 - (b) associating each of the random or pseudo random sequences with one or more references to encoding functions for encoding watermarks into a content signal, and with each of the plurality of digital watermarks to be embedded; [and]
 - (c) combining the random or pseudo-random sequence with said at least one or more references to encoding functions to form a random key; and
- (2) providing each of the plurality of digital watermarks to be embedded; and
- (3) embedding each of the plurality of digital watermarks into the content signal using the random key associated with the respective digital watermark.

48. (Previously Presented) The method of claim 47, further comprising:
interleaving information about each of said plurality of digital watermarks into the content signal.
49. (Previously Presented) The method of claim 48 wherein the interleaving is accomplished using functions which operate on the content signal in the time domain.
50. (Previously Presented) The method of claim 48 wherein the interleaving is accomplished using functions which operate on the content signal in the frequency domain

51. (Previously Presented) The method of claim 50 wherein the interleaving is accomplished by placing information about each of said plurality of digital watermarks into specific frequency bands of the content signal.

52. (Previously Presented) The method of claim 47 further comprising:

generating a decode key for each of the plurality of digital watermarks that was embedded.

53. (Cancelled)

54. (Cancelled)

55. (Cancelled)

56. (Cancelled)

57. (Cancelled)

58. (Cancelled)

59. (Previously Presented) A digital watermarking system for encoding digital watermarks into a content signal, the system comprising:

an input device for receiving the content signal;

a watermark generator to generate at least one watermark to be embedded into the content signal;

a random key generator to generate at least one random key;

a function generator which is capable of generating a plurality of encoding functions;

an association device to associate one of said at least one random key with at least one of said plurality of encoding functions and with a watermark generated by the watermark generator; and

an encoding device to encode a watermark generated by the watermark generator into the content signal using the functions associated with said watermark.

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60. (Previously Presented) The digital watermarking system of claim 59, further comprising:

a storage device for storing each random key that is associated with at least one encoding function and with a watermark, which association is made by the association device.

61. (Previously Presented) The digital watermarking system of claim 60 wherein the storage device comprises a database for storing each random key that is associated with at least one encoding function and with a watermark, which association is made by the association device.

62. (Previously Presented) The digital watermarking system of claim 59, further comprising:

a decoding device to decode a watermark that has been embedded into the content signal.

63. (Previously Presented) The digital watermarking system of claim 59, wherein the function generator comprises:

a preprocessor for preprocessing the content signal; and
a function generator which is capable of generating a plurality of encoding functions based upon input received from the preprocessor.

64. (Previously Presented) The digital watermarking system of claim 63, wherein the preprocessor includes means to select a sample window size for the content signal, a signal encoding level, and at least one of the following two groups: time delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal.

65. (Previously Presented) The digital watermarking system of claim 59, wherein the association device comprises:

a concatenator to concatenate the random key together with at least one of said plurality of encoding functions into an concatenated string;

an encrypting device to encrypt the concatenated string; and

a storage device for storing the encrypted, concatenated string in a database.

66. (Previously Presented) The digital watermarking system of claim 59, wherein the association device comprises:

means to place information about an embedded watermark into the content signal.

67. (Previously Presented) The digital watermarking system of claim 59, wherein the association device places information about an embedded watermark into the content signal at a predetermined frequency.

68. (Previously Presented) The digital watermarking system of claim 59, wherein the function generator comprises:

a processor for processing the content signal;

a display device for displaying information about the processed content signal;

an interface for receiving input from a human operator; and

a function generator which is capable of generating a plurality of encoding functions based upon input received from the interface.

69. (Previously Presented) The digital watermarking system of claim 63, wherein the interface includes means for the human operator to select a sample window size for the content signal, a signal encoding level, and at least one of the following two groups: time delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal.

70. (Previously Presented) A digital watermarking system for encoding digital watermarks into a content signal, the system comprising:

an input device for receiving the content signal;

a watermark generator to generate at least one watermark to be embedded into the content signal;

a random number generator to generate at least one sequence of random binary numbers;

a function generator which is capable of generating a plurality of encoding functions;

a watermarking key generator which generates a watermarking key using a sequence of random binary numbers generated by the random number generator and using input from the function generator;

an encoding device to encode a watermark generated by the watermark generator into the content signal using a watermarking key generated by the watermarking key generator.

71. (Previously Presented) The digital watermarking system of claim 70, wherein the function generator comprises:

a processor for processing the content signal;

a display device for displaying information about the processed content signal;

an interface for receiving input from a human operator; and

a function generator which is capable of generating a plurality of encoding functions based upon input received from the interface.

72. (Previously Presented) The digital watermarking system of claim 71, wherein the interface includes means for the human operator to select a sample window size for the content signal, a signal encoding level, and at least one of

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the following two groups: time delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal.

73. (Previously Presented) The digital watermarking system of claim 70, wherein the function generator comprises

a processor for processing the content signal;

a display device for displaying at least two sample streams of the content signal for selection;

an interface for wherein a human operator may select one of said at least two sample streams of the content signal, may specify sample window size, signal encoding level, may specify at least one of the following two groups: time delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal; and

a function generator which is capable of generating a plurality of encoding functions based upon input received from the interface.

74. (Previously Presented) The digital watermarking system of claim 73, wherein the interface includes means to update the display device to reflect the human interactive input.

75. (Previously Presented) The digital watermarking system of claim 70, wherein further comprising:

means to place information about an embedded watermark into the content signal.

76. (Previously Presented) The digital watermarking system of claim 75, wherein the means to place information comprises:

means to place information about an embedded watermark into a predetermined location within the content signal.

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77. (Previously Presented) The digital watermarking system of claim 74, further comprising:

a decoding device to decode a watermark that has been embedded into the content signal.

78. (Previously Presented) The digital watermarking system of claim 75, further comprising:

a decoding device to that can access the information about an embedded watermark that has been placed within the content signal to authenticate the embedded watermark.

79. (Previously Presented) A digital watermarking system for encoding and decoding at least one digital watermark within a content signal, the system comprising:

a digital watermark encoder; and

a digital watermark decoder;

said digital watermark encoder and said digital watermark decoder being configured to respectively encode and decode at least one digital watermark using (1) a watermarking key that encodes a watermark into a content signal using a random or pseudo-random binary sequence and (2) an encode and decode pair associated with the watermarking key.

80. (Previously Presented) The digital watermarking system of claim 79, wherein said digital watermark encoder comprises a first software program, and said digital watermark decoder comprises a second software program, said first program being independent of said second program.

81. (Previously Presented) The digital watermarking system of claim 79, wherein said digital watermark encoder comprises a first hardware device and said digital watermark decoder comprises a second hardware device, said first hardware device being separate from said second hardware device.

82. (Previously Presented) The digital watermarking system of claim 79 wherein the digital watermarking encoder is capable of encoding a digital watermark using a watermarking key comprising a random sequence of binary numbers and information describing the application of the random sequence to the content signal, wherein the information comprises a sample window size, a signal encoding level, and at least one of the following two groups: time delimiters describing segments of the content signal; frequency delimiters describing frequency bands of the content signal.
83. (Previously Presented) The digital watermarking system of claim 79, wherein the digital watermark decoder comprises a software decoding key for detecting each digital watermarks that has been encoded within a content signal.
84. (Previously Presented) The digital watermarking system of claim 79, wherein the digital watermark decoder comprises software embedded in hardware that is programmed to automatically search for any watermarks in any data that is stored within a memory of the hardware.
85. (Previously Presented) The digital watermarking system of claim 84, wherein the digital watermark decoder comprises a compact disk player that is programmed to automatically search for any watermarks that might be embedded into a compact disk.
86. (Previously Presented) The digital watermarking system of claim 84, wherein the digital watermark decoder comprises a virus scanner that automatically searches for any watermarks that might be embedded into the data being scanned for viruses.